

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re Patent application of:

Applicant(s): James Robert Durrant et al.  
Serial No: 10/520,608  
Filing Date: January 3, 2006  
Title: OXYGEN-SCAVENGING PACKAGING  
Examiner: Marc A. Patterson  
Art Unit: 1794  
Docket No. FRYHP0127US

**REPLY BRIEF**

Mail Stop Appeal Brief-Patents  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

This brief is submitted in response to the Examiner's Answer dated July 16, 2010. In the event any fee or additional fee is necessary, the Commissioner is authorized to charge those fees to our Deposit Account No. 18-0988 under Docket No. FRYHP0127US.

## **I. Response to Examiner's Answer**

The Examiner's response to applicant's arguments has been carefully reviewed. Based on the Examiner's comments, it appears that the Examiner is continuing to construe the teachings of Ebner in an attempt to identify the claimed features of the present application. Applicants submit that Ebner is being construed beyond its bounds and that Ebner fails to disclose or suggest the features of the claimed subject matter.

The present application is directed to a light-activated oxygen scavenging element. More specifically, an oxygen scavenging element is disclosed for de-oxygenating a closed-environment of a packaging by exposing the oxygen scavenging element to ultra-bandgap light.

Referring to claim 1, the claimed package includes an oxygen-scavenging element which includes a photo-activatable semiconductor and an electron donor. When exposed to ultra-bandgap light, the semiconductor generates electron-hole pairs, with electrons acting to reduce oxygen and thereby scavenge the oxygen from the closed environment. The holes are combined with electrons sacrificed by the electron donor.

By contrast, Ebner is directed to a moisture-activated oxygen-scavenging composition that comprises at least one hydroxosulfite metalate (HSM) in combination with at least one transition metal ion source. (see, e.g., Ebner, Col. 3, lines 31-35.) The HSM oxygen scavenging agent is used in combination with small amounts of transition metal ions to provide enhanced oxygen scavenging activity when the agent is placed in the presence of oxygen and moisture. (Ebner, column 4, lines 28-34; column 6, lines 63-67.)

**A. Ebner does not teach or suggest the claimed photo-activatable semiconductor.**

In the Examiner's answer, the Examiner continues to assert that Ebner discloses the positive oxidation state of titanium (i.e.  $\text{TiO}_2$ ), and therefore discloses a photo-activatable semiconductor as recited in claims 1 and 15. Specifically, the Examiner contends that

[I]n addition to the disclosure of titanium metal, at column 4, line 52, Ebner et al disclose the oxides of the metal at column 5, line 52; Ebner et al therefore discloses oxide salt of titanium, and Ebner et al therefore disclose titanium dioxide.

(Examiner's Answer, page 7.)

Ebner identifies specific transition metals suitable for use in the oxygen-scavenging combination, which admittedly include titanium. (column 4, line 53.) Ebner also identifies transition metal compounds that may be provided by specific transition metal salts. (column 5, line 56 – column 6, line 9.) But Ebner does not disclose the positive oxidation state of titanium among those inorganic transition metal salts identified as suitable for use in the oxygen-scavenging combination.

It may not simply be assumed that the positive oxidation state of every identified transition metal is suitable for use in Ebner's oxygen-scavenging combination. As discussed above, suitable transition metal ions provide enhanced oxygen scavenging activity. But Ebner acknowledges that

The positive oxidation state of the metal when introduced as part of the system is not necessarily that of the active state which causes enhanced activity and capacity to the system.

(column 4, lines 57-60.)

Applicants submit that this holds true for titanium dioxide, the positive oxidation state of titanium. Titanium dioxide is in a completely oxidized state and is therefore incapable of undergoing further oxidation if utilized in the oxygen-scavenging combination of Ebner. Therefore, the positive oxidation state of titanium (i.e., titanium dioxide) is outside the scope of the suitable transition metal compounds in Ebner, as titanium dioxide would not provide the intended functionality of the transition metal compound.

Accordingly, Ebner does not disclose or suggest titanium dioxide and therefore does not disclose or suggest a photo-activatable semiconductor.

**B. Ebner does not teach or suggest the claimed electron donor.**

Claim 3 recites that the electron donor of claim 1 comprises an organic material comprising a polymeric material. Claim 4 further recites that the polymeric material of claim 3 comprises PVA, PVC, PEG, polyethylene oxide, hydroxyethyl cellulose, or a mixture thereof.

In the Examiner's Answer, the Examiner contends that

because Ebner et al discloses titanium dioxide, as stated above, and polyvinyl chloride as a carrier, as in the claimed invention, Ebner et al disclose polyvinyl chloride that functions as an electron donor, as in the claimed invention.

(Examiner's Answer, page 7.)

The Examiner's contentions are premised upon the misconception that Ebner discloses titanium dioxide. That is, the Examiner is asserting that the polyvinyl chloride carrier of Ebner would function as an electron donor in the presence of titanium dioxide when exposed to ultra-bandgap light. But for reasons described above, Ebner does not

disclose or suggest titanium dioxide and therefore does not disclose or suggest a photo-activatable semiconductor.

Moreover, Ebner does not teach or suggest that the polymeric matrix of Ebner functions as an electron donor. Ebner simply discloses the use of polymeric matrix as a carrier for the oxygen-scavenging combination that maintains the agent free from moisture prior to use in the packaging environment, and also permits the ingress of oxygen and water into the carrier while in the packaging environment, thereby permitting oxygen scavenging to occur. (Ebner, column 7, lines 3-8; column 8, lines 25-26; column 8, lines 36-48.)

Accordingly, Ebner does not teach or suggest the claimed electron donor.

**C. Ebner does not teach or suggest that the claimed semiconductor comprises ZnO or WO<sub>3</sub>.**

Claim 16 recites that the photo-activatable oxide semiconductor of claim 14 comprises zinc oxide (ZnO). Claim 17 recites that the photo-activatable oxide semiconductor of claim 14 comprises tungsten trioxide (WO<sub>3</sub>).

In the Examiner's Answer, the Examiner contends that

although metals are disclosed by Ebner et al as transition elements which are included, the transition metals disclosed are not limited by Ebner et al; the transition metal salts disclosed by Ebner et al therefore include zinc and tungsten salts.

(Examiner's Answer, page 7.)

As discussed above, Ebner identifies specific transition metals suitable for use in the oxygen-scavenging combination. Specifically, Ebner teaches the use of transition metals of the first transition series of the Periodic Table composed of elements 21 through 29. (column 4, lines 51-53.) Zinc (element 30) and tungsten (element 74) are

not included among the identified transition metals. It follows that, Ebner neither discloses nor suggests the positive oxidation state of zinc (ZnO) or the positive oxidation state of tungsten (WO<sub>3</sub>) among the inorganic transition metal salts suitable for use in the oxygen-scavenging combination. (column 5, line 56 – column 6, line 9.) Accordingly, Ebner does not teach or suggest that the claimed semiconductor comprises zinc oxide (ZnO) or tungsten trioxide (WO<sub>3</sub>).

**D. There is no rational basis for why one of ordinary skill in the art would modify the polymer matrix of Ebner so as to comprise thiol.**

Claim 8 recites that the [electron donor] of claim 1 comprises a thiol. In the Examiner's Answer, the Examiner contends that

The inhibition of oxygen scavenging by thiol is not disclosed by Ebner et al; furthermore as stated in the previous Action, it would have been obvious for one of ordinary skill in the art to provide for thiol in Ebner et al to provide corrosion resistance as taught by Fisher et al.

(Examiner's Answer, page 7.)

There is no rational basis for why one of ordinary skill in the art would modify the carrier of Ebner so as to comprise thiol. The polymeric material in Ebner is disclosed as being suitable for maintaining the agent free from moisture prior to use in the packaging environment, and permitting the ingress of oxygen and water into the carrier while in the packaging environment, thereby permitting oxygen scavenging to occur. (Ebner, column 7, lines 3-8; column 8, lines 25 and 26; column 8, lines 36-48.) There is no teaching or suggestion in either Ebner or Fisher that the use of thiol in the carrier would maintain such functionality.

## II. Conclusion

In view of the foregoing, it is respectfully submitted that the claims are patentable over the applied art and that the rejections advance by the Examiner should be reversed.

Respectfully submitted,

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